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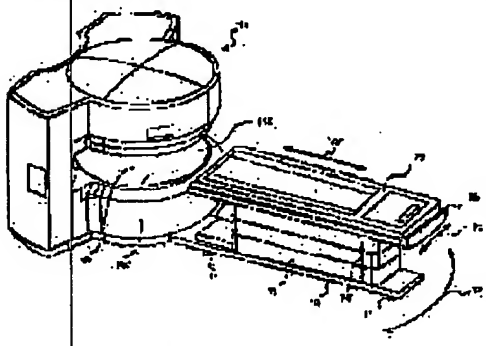
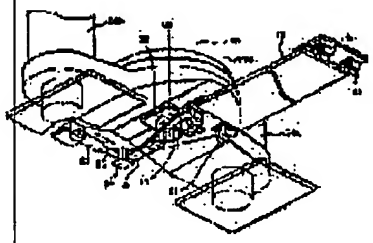
# (54) MAGNETIC RESONANCE IMAGING DEVICE





(57)Abstract:

PROBLEM TO BE SOLVED: To improve the imaging efficiency, improve the image quality and to reduce a testee's burden by providing a patient table with a swing moving means capable of feeding a top plate into an opening part from any angle and swing-moving in such a manner that the longitudinal movement feeding direction is always directed to the center of a magnetic field in a gantry.

SOLUTION: A patient table 71 is disposed on a patient table support table 10, and a roller 11 is fitted to the lower side of the support table 10 to be swing-moved in the circumferential direction of a circle taking the center of a magnetic field as the center in such a manner that the longitudinal movement feeding direction is always directed to the center of a magnetic field in a gantry 13. The roller 11 is fitted to the support table 10 at an angle according to the swing moving locus, and the support table 10 is connected to an intermediate connecting member 22 journalled to the rotating shaft 23 of the lower part of the gantry 13. The intermediate connecting member 22 is connected to a transmission member 24 for transmitting the driving force from a hydraulic cylinder 21, whereby the intermediate connecting member 22 is turned on the rotating shaft 101 by the advance and retreat in the driving direction 25 of a hydraulic cylinder 21 to swing-move the patient table support table 10.

## CLAIMS

[Claim(s)]

[Claim 1] The gantry equipped with each magnetic field generating means of a static magnetic field and an inclination magnetic field by which opening was greatly opened in the front face, The high frequency coil which irradiates an electromagnetic wave at analyte or detects the magnetic resonance signal from analyte, An image reconstruction means to obtain the image which expresses the physical property of said analyte based on the signal detected with this high frequency coil, Vertical migration of the direction of an analyte body axis which the top plate which lay [ said ] is sent [ direction ] into said opening circles, or retreats said opening outside from the feed location, In the magnetic resonance imaging which comes to have a patient table with a top-plate migration means to make respectively horizontal horizontal migration which intersects perpendicularly with the direction of this vertical migration, and vertical movement of said top plate besides said opening Said patient table the top plate which lay [ said ] can be sent into said opening circles from every include angle of the opening, and the direction of a vertical migration feed always goes centering on the magnetic field in a gantry -- as -- swing -- the magnetic resonance imaging characterized by providing a movable swing migration means.

[Claim 2] The gantry equipped with each magnetic field generating means of a static magnetic field and an inclination magnetic field by which opening was greatly opened in the front face, The high frequency coil which irradiates an electromagnetic wave at analyte or detects the magnetic resonance signal from analyte, An image reconstruction means to obtain the image which expresses the physical property of said analyte based on the signal detected with this high frequency coil, Vertical migration of the direction of an analyte body axis which the top plate which lay [ said ] is sent [ direction ] into said opening circles, or retreats said opening outside from the feed location, In the magnetic resonance imaging which comes to have a patient table with a top-plate migration means to make respectively horizontal horizontal migration which intersects perpendicularly with the direction of this vertical migration, and vertical movement of said top plate besides said opening A top plate common to both the tables on which pair arrangement was carried out at the right-and-left both sides of a gantry, and said patient table lay between these tables Magnetic resonance imaging characterized by providing the top-plate horizontal movable support means supported possible [ it is movable considering the magnetic field core in a gantry as the shunt, and / horizontal migration of the top plate ] when the top plate which lay is located centering on said magnetic field.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] In case this invention sends in a top plate in a gantry, it moves the photography part of a request of analyte easily and correctly centering on a magnetic field, and relates to the magnetic resonance imaging (henceforth MRI equipment) in which alignment is possible.

[0002]

[Description of the Prior Art] MRI equipment is constituted in preparation for the gantry part in a static magnetic field generator, an inclination magnetic field generator, RF irradiation equipment (RF irradiation equipment), and a RF transceiver coil (RF (RF) coil). Drawing 6 and drawing 7 are drawings showing the above-mentioned gantry part. The static magnetic field generator As shown in these drawing 6 and drawing 7 , it has the disc-like pole pieces 51a and 51b made to counter through the measurement space 50 which inserts analyte (not shown). The permanent magnets 52a and 52b of a pair with which polarities differ in the rear-face side are arranged in the state of adhesion to pole pieces 51a and 51b and each **. It has the yoke plates 53a and 53b of the pair which carries out maintenance immobilization of these permanent magnets 52a and 52b, and these yoke plate 53a and both 53b are connected further, and it comes to have two contact bars 54a and 54b for holding yoke plate 53a and between 53b in fixed distance. In this case, since two contact bars 54a and 54b are located in the rear-face side of a gantry 13, they have set greatly the feed to the measurement space 50 of analyte, and the opening 110 which performs retreat to the front-face side of a gantry 13, without being obstructed by these contact bars 54a and 54b. An inclination magnetic field generator (not shown) and RF irradiation equipment 55a and 55b are a flat mold, and a mutual distance of the RF irradiation equipment 55a and 55b which opening 110 is not closed by these, either and is in the measurement space 50 side serves as opening height (height dimension of the measurement space 50).

[0003] Moreover, as shown in drawing 8 and drawing 9 , the patient table 71 for sending analyte into the magnetic field core in a gantry 13 has a top-plate locomotive function with the vertical movement which is the horizontal migration which is the vertical migration which is migration of the direction 72 of an analyte body axis (lengthwise direction), and migration of the direction (longitudinal direction) 73 which intersects perpendicularly in the direction 72 of a body axis besides a gantry 13, and migration of the vertical direction 74. In this case, in vertical migration, only the top plate 75 which lay is sent in into a gantry 13, and horizontal migration and vertical movement move the whole top-plate supporter 76. Analyte is carried on a top plate 75, when it is in a vertical-movement minimum in principle, and after raising it to the height to which the roller (not shown) of top-plate 75 rear face touches exactly RF irradiation equipment 55a of the gantry opening 110 bottom, it is sent in with a top plate 75 into a gantry 13 by vertical migration. Since support of the top plate 75 within a gantry 13 is made at this time because the above-mentioned roller on top-plate 75 background appears in lower RF irradiation equipment 55a, the top plate 75 within a

gantry 13 is possible only for vertical migration (it feeds and retreats), and cannot perform horizontal migration.

[0004] For this reason, when the need for horizontal migration arises within a gantry 13, once retreating and carrying out horizontal migration of the top plate 75 out of a gantry 13, it is necessary to send in into a gantry 13 by vertical migration again. The condition after performing a feed for the second time is shown in drawing 10 . Moreover, since positioning immobilization is carried out according to the core of gantry 13 longitudinal direction (cross direction) as shown in drawing 8 - drawing 10 , and arrangement of the patient table 71 can send a top plate 75 into a gantry 13 only from an one direction, positioning for sending analyte into a magnetic field core also has only selection of only the direction (biaxial) in every direction. Furthermore, even if the location is a marginal location of a lengthwise direction, it is necessary to make it retreat again to the original location (location on which analyte was put), when photography is completed and it retreats analyte from the inside of a gantry 13.

[0005]

[Problem(s) to be Solved by the Invention] Consideration with the above-mentioned conventional technique sufficient about locating the photography part of analyte centering on a magnetic field, and taking a photograph in the best location of a uniformity coefficient was not carried out. Taking a photograph in the best location of magnetic homogeneity has the big advantage that the good image which produces neither a cuff of the image by the magnetic field ununiformity, nor distortion, degradation of S/N, etc. can be obtained. However, as mentioned above, since positioning immobilization is carried out according to the core of gantry 13 longitudinal direction (cross direction) as shown in drawing 8 - drawing 10 , and arrangement of the patient table 71 can send a top plate 75 into a gantry 13 only from an one direction, positioning for sending analyte into a magnetic field core also has only selection of only the direction (biaxial) in every direction. For this reason, depending on a photography part, the case where neither the feed based on magnetic fields nor positioning is easy arises. Moreover, since horizontal migration within a gantry 13 cannot be performed, once retreating and carrying out horizontal migration of the top plate 75 out of a gantry 13 in the measurement space 50 to move another photography part to the magnetic field core in the measurement space 50 immediately after photography termination of a certain photography part, it is necessary to send in into a gantry 13 by vertical migration again. Actuation becomes complicated by this, a throughput will fall, and photography effectiveness will fall. For this reason, the image quality of the image with which the feed or alignment based on magnetic fields are not correctly made, but are obtained may deteriorate. Moreover, there were various troubles, such as a cameraman sensing troublesomeness and also becoming hanging a burden great to the analyte which is not healthy when it is going to cope with it by moving analyte on a top plate 75, without carrying out horizontal migration of the top plate 75.

[0006] The purpose of invention of claim 1 is to offer the MRI equipment which can plan improvement in photography effectiveness, improvement in image quality, and derating of analyte, and can cancel a cameraman's troublesomeness.

[0007] The purpose of invention of claim 2 is to offer the MRI equipment which can plan large

improvement in photography effectiveness, improvement in image quality, and derating of analyte, and can cancel a cameraman's troublesomeness.

[0008]

[Means for Solving the Problem] The gantry by which the purpose of invention of claim 1 was equipped with each magnetic field generating means of a static magnetic field and an inclination magnetic field, and opening was greatly opened in the front face, The high frequency coil which irradiates an electromagnetic wave at analyte or detects the magnetic resonance signal from analyte, An image reconstruction means to obtain the image which expresses the physical property of said analyte based on the signal detected with this high frequency coil, Vertical migration of the direction of an analyte body axis which the top plate which lay [ said ] is sent [ direction ] into said opening circles, or retreats said opening outside from the feed location, In the magnetic resonance imaging which comes to have a patient table with a top-plate migration means to make respectively horizontal horizontal migration which intersects perpendicularly with the direction of this vertical migration, and vertical movement of said top plate besides said opening the top plate which lay [ said ] said patient table can be sent into said opening circles from every include angle of the opening, and the direction of a vertical migration feed always goes centering on the magnetic field in a gantry -- as -- swing -- it is attained by establishing and constituting a movable swing migration means. If the above swing migration means are established, it can position easily also to various photography parts of analyte, it can send into the magnetic field core in a gantry, the alignment of the above-mentioned photography part can be easily carried out to the above-mentioned magnetic field core, improvement in photography effectiveness, improvement in image quality, and derating of analyte can be planned, and the dissolution of a cameraman's troublesomeness will be realized respectively.

[0009] The gantry by which the purpose of invention of claim 2 was equipped with each magnetic field generating means of a static magnetic field and an inclination magnetic field, and opening was greatly opened in the front face, The high frequency coil which irradiates an electromagnetic wave at analyte or detects the magnetic resonance signal from analyte, An image reconstruction means to obtain the image which expresses the physical property of said analyte based on the signal detected with this high frequency coil, Vertical migration of the direction of an analyte body axis which the top plate which lay [ said ] is sent [ direction ] into said opening circles, or retreats said opening outside from the feed location, In the magnetic resonance imaging which comes to have a patient table with a top-plate migration means to make respectively horizontal horizontal migration which intersects perpendicularly with the direction of this vertical migration, and vertical movement of said top plate besides said opening A top plate common to both the tables that carried out pair arrangement of said patient table at the right-and-left both sides of a gantry, and lay between these tables It is movable considering the magnetic field core in a gantry as the shunt, and when the top plate which lay is located centering on said magnetic field, it is attained by establishing the top-plate horizontal movable support means supported possible [ horizontal migration of the top plate ]. If pair arrangement of the patient table is carried out as mentioned above at the right-and-left both sides of a gantry and a top-plate horizontal movable support means is

established It can position easily also to various photography parts of analyte, it can move to the magnetic field core in a gantry, and the alignment of the above-mentioned photography part can be easily carried out to the above-mentioned magnetic field core. improvement in photography effectiveness, improvement in image quality, and derating of analyte can be planned, and the dissolution of a cameraman's troublesomeness is realized respectively -- having -- moreover, right and left of a gantry -- the analyte to a patient table carries from any side, demotion becomes possible, and photography effectiveness improves further.

[0010]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing. Drawing 1 - drawing 4 are drawings for explaining 1 operation gestalt of the MRI equipment by invention of claim 1, and the top view which drawing 1 takes out a perspective view, and drawing 2 takes out an important section, and is shown from a base side, the perspective view which drawing 3 similarly takes out an important section and is shown from a base side, and drawing 4 are the side elevations inside a patient table part. In drawing 1 - drawing 4 , the same sign as drawing 6 - drawing 10 shows the same or a considerable part. Moreover, in drawing 1 - drawing 4 , the same sign shows the same part. the MRI equipment of claim 1 can send in the top plate 75 which lay the patient table 71 (not shown) also from the include angle (direction) of the opening 110 throat into the opening 110 of a gantry 13, and the direction of a vertical migration feed always goes centering on the magnetic field in a gantry 13 -- as -- swing -- a movable swing migration means is established and constituted.

[0011] That is, as shown in drawing 1 , the patient table 71 is arranged on the patient table susceptor 10, and is movable according to a motion of this susceptor 10. And a roller 11 is attached in the lower part of this susceptor 10, and it can move to the circumferencial direction 12 of the circle centering on a magnetic field core so that the direction of a vertical migration feed may always go centering on the magnetic field in a gantry 13 (swing migration). Here, if the above-mentioned swing migration is explained, as shown in drawing 2 and drawing 3 , the above-mentioned roller 11 is attached in susceptor 10 with the include angle doubled with swing migration locus 12' so that swing migration may be performed smoothly, and susceptor 10 is connected with the middle connection member 22 fixed by the revolving shaft 23 attached in the lower part of a gantry 13. In this case, the middle connection member 22 is connected with the transfer member 24 which tells the driving force from an oil hydraulic cylinder 21. That is, when an oil hydraulic cylinder 21 moves to the driving direction 25, the middle connection member 22 is rotated centering on a revolving shaft O1 through the transfer member 24, and it is made as [ carry out / the patient table susceptor 10 / swing migration ]. In addition, as shown in drawing 4 , the hydraulic-drive unit 31 for making the above-mentioned oil hydraulic cylinder 21 drive is arranged to the patient table 71 interior, and the driving force is transmitted to an oil hydraulic cylinder 21 through the oil pressure transfer path 32, and it is constituted so that actuation of an oil hydraulic cylinder 21 may be controlled.

[0012] Since the MRI equipment of claim 1 established the swing migration means as mentioned above, it can be easily positioned also to various photography parts of analyte, can be sent into the

magnetic field core in a gantry 13, can carry out alignment of the above-mentioned photography part easily to the above-mentioned magnetic field core, and can plan improvement in photography effectiveness, improvement in image quality, and derating of analyte, and the dissolution of a cameraman's troublesomeness can realize it respectively.

[0013] Drawing 5 is the perspective view showing 1 operation gestalt of the MRI equipment by invention of claim 2. In this drawing 5 , the same sign as drawing 1 - drawing 4 shows the same or a considerable part. In 72a and 72b, the direction of an analyte body axis (top-plate lengthwise direction), and 73a and 73b show 74a, and a top-plate longitudinal direction and 74b show the top-plate vertical direction. Namely, the MRI equipment shown in drawing 5 carries out pair (a [ 71 ], 71b) arrangement of the patient table 71 at the right-and-left both sides of a gantry 13. The top plate 75 common to both the tables 71a and 71b that lay is movable considering the magnetic field core in a gantry 13 as the shunt in these tables 71a and between 71b. Moreover, when the top plate 75 which lay is located centering on [ above-mentioned ] a magnetic field, the top-plate horizontal movable support means supported possible [ horizontal migration of the top plate 75 ] is established. When the top plate 75 which lay is located as a top-plate horizontal movable support means centering on the magnetic field in a gantry 13, it has the top-plate supporters 76a and 76b which perform migration (horizontal migration) in the longitudinal directions 73a and 73b of a top plate 75 to coincidence. the top plate 75 for carrying analyte -- right and left -- when it can send in into a gantry 13 from both of the patient tables 71a and 71b and this top plate 75 appears on both patient table 71a and 71b, it is not necessary to support that top plate 75 on the RF irradiation equipment 55a top face of the opening 110 bottom, and is made as [ support / with the top-plate supporters 76a and 76b of the patient tables 71a and 71b on either side ]. At this time, it is made as [ go up / the top-plate supporters 76a and 76b of the patient tables 71a and 71b on either side / a little ] so that the RF irradiation equipment 55a top face of the opening 110 bottom cannot be touched.

[0014]

[Effect of the Invention] According to invention of claim 1, since the swing migration means was established, the alignment of various photography parts of analyte can be easily carried out to the magnetic field core in a gantry, and improvement in photography effectiveness, improvement in image quality, and derating of analyte can be planned, and it is effective in a cameraman's troublesomeness being cancelable. Since according to invention of claim 2 pair arrangement of the patient table was carried out at the right-and-left both sides of a gantry and the top-plate horizontal movable support means was established, the alignment of various photography parts of analyte can be easily carried out to the magnetic field core in a gantry, and improvement in photography effectiveness, improvement in image quality, and derating of analyte can be planned, and it is effective in a cameraman's troublesomeness being cancelable. moreover, right and left of a gantry -- the analyte to a patient table carries from any side, and it is effective in demotion being possible and being able to aim at improvement in the further photography effectiveness.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing 1 operation gestalt of the MRI equipment by invention of claim 1.

[Drawing 2] It is the top view which takes out the important section of equipment same as the above, and is shown from a base side.

[Drawing 3] It is the perspective view which similarly takes out an important section and is shown from a base side.

[Drawing 4] It is a side elevation inside the patient table part of the MRI equipment shown in drawing 1 .

[Drawing 5] It is the perspective view showing 1 operation gestalt of the MRI equipment by invention of claim 2.

[Drawing 6] It is the perspective view of the gantry part of MRI equipment.

[Drawing 7] a part of gantry part of MRI equipment -- it is a cutting front view.

[Drawing 8] It is the perspective view of conventional MRI equipment.

[Drawing 9] It is the perspective view of conventional MRI equipment.

[Drawing 10] It is the perspective view of conventional MRI equipment.

[Description of Notations]

10 Patient Table Susceptor

11 Roller

12 Circumferencial Direction

12' Swing migration locus

13 Gantry

21 Oil Hydraulic Cylinder

22 Middle Connection Member

23 Revolving Shaft

24 Transfer Member

25 Oil Hydraulic Cylinder Driving Direction

O1 Revolving shaft

31 Hydraulic-Drive Unit

32 Oil Pressure Transfer Path

50 Measurement Space

51a, 51b Pole piece

52a, 52b Permanent magnet

53a, 53b Yoke plate

54a, 54b Contact bar

55a, 55b RF irradiation equipment

71, 71a, 71b Patient table

72, 72a, 72b The direction of an analyte body axis (top-plate lengthwise direction)

73, 73a, 73b Direction which intersects perpendicularly in the direction of a body axis (top-plate longitudinal direction)

74, 74a, 74b The top-plate vertical direction

75 Top Plate

76, 76a, 76b Top-plate supporter

110 Gantry opening.

CORRECTION OR AMENDMENT

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[Proposed Amendment]

[Claim(s)]

[Claim 1] The gantry equipped with each magnetic field generating means of a static magnetic field and an inclination magnetic field by which opening was greatly opened in the front face The high frequency coil which irradiates an electromagnetic wave at analyte or detects the magnetic resonance signal from analyte An image reconstruction means to obtain the image which expresses the physical property of said analyte based on the signal detected with this high frequency coil A patient table with a top-plate migration means to make respectively vertical migration of the direction of an analyte body axis which the top plate which lay [ said ] is sent [ direction ] into said opening circles, or retreats said opening outside from that feed location, horizontal horizontal migration which intersects perpendicularly with the direction of this vertical migration, and vertical movement of said top plate in said opening outside it is magnetic resonance imaging equipped with the above, and said patient table can send into said opening circles the top plate which lay [ said ] from every include angle of the opening, and the direction of a vertical migration feed always goes centering on the magnetic field in a gantry -- as -- swing -- it is characterized by providing a movable swing migration means.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0007

[Method of Amendment] Deletion

[Procedure amendment 3]

[Document to be Amended] Specification

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